INTERNATIONAL STANDARD

ISO 22476-10

First edition
2017-10

Geotechnical investigation and testing — Field testing —

Part 10: Weight sounding test

Reconnaissance et essais géotechniques — Essais en place —

Partie 10: Essai de sondage par poids

STANDARDSISO.COM : Click to view the full PDF of ISO 22476-10:2017

Reference number
ISO 22476-10:2017(E)

© ISO 2017

STANDARDSISO.COM : Click to view the full PDF of ISO 22476-10:2017

COPYRIGHT PROTECTED DOCUMENT

© ISO 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

 © ISO 2017 – All rights reserved

Contents

Page

STANDARDSISO.COM : Click to view the full PDF of ISO 22476-10:2017

© ISO 2017 – All rights reserved

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

ISO 22476-10 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 341, *Geotechnical investigation and testing*, in collaboration with ISO Technical Committee ISO/TC 182, *Geotechnics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition of ISO 22476-10 cancels and replaces ISO/TS 22476-10:2005, which has been technically revised.

A list of all parts in the ISO 22476 series can be found on the ISO website.

STANDARDSISO.COM : Click to view the full PDF of ISO 22476-10:2017

 © ISO 2017 – All rights reserved

Geotechnical investigation and testing — Field testing —

Part 10:
Weight sounding test

1 Scope

This document specifies the equipment, execution and reporting requirements of the weight sounding test.

NOTE This document fulfils the requirements for the weight sounding test as part of the geotechnical investigation and testing according to EN 1997–1 and EN 1997–2.

This document specifies the procedure for conducting a test with the weight sounding device in natural soils, made ground, and fill either on land or on water. This document is applicable to the determination of the resistance of soil to the static load or the static load and the specified turning of the sounding point.

This document gives guidelines for the use of the weight sounding test to give a continuous soil profile and an indication of the layer sequence. The use includes the estimation of the density of cohesionless soils and the depth to very dense ground layers indicating the length of end-bearing piles.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14688 (all parts), *Geotechnical investigation and testing — Identification and classification of soil*

ISO 14689-1, *Geotechnical investigation and testing — Identification and classification of rock — Part 1: Identification and description*

ISO 22475-1, *Geotechnical investigation and testing — Sampling methods and groundwater measurements — Part 1: Technical principles for execution*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22475-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
weight sounding resistance
smallest standard load for which the penetrometer sinks without rotation, or the number of half turns per 0,20 m of penetration when the penetrometer has its maximum load and is rotated

STANDARDSISO.COM : Click to view the full PDF of ISO 22476-10:2017

© ISO 2017 – All rights reserved

3.2
manual weight sounding test
test made by loading and rotating the penetrometer by hand using a handle

Note 1 to entry: The penetrometer is loaded by weights.

3.3
mechanized weight sounding test
test in which loading and rotating the penetrometer is mechanical

Note 1 to entry: The penetrometer is loaded mechanically or by dynamometer or by weights.

4 Equipment

4.1 Penetrometer point

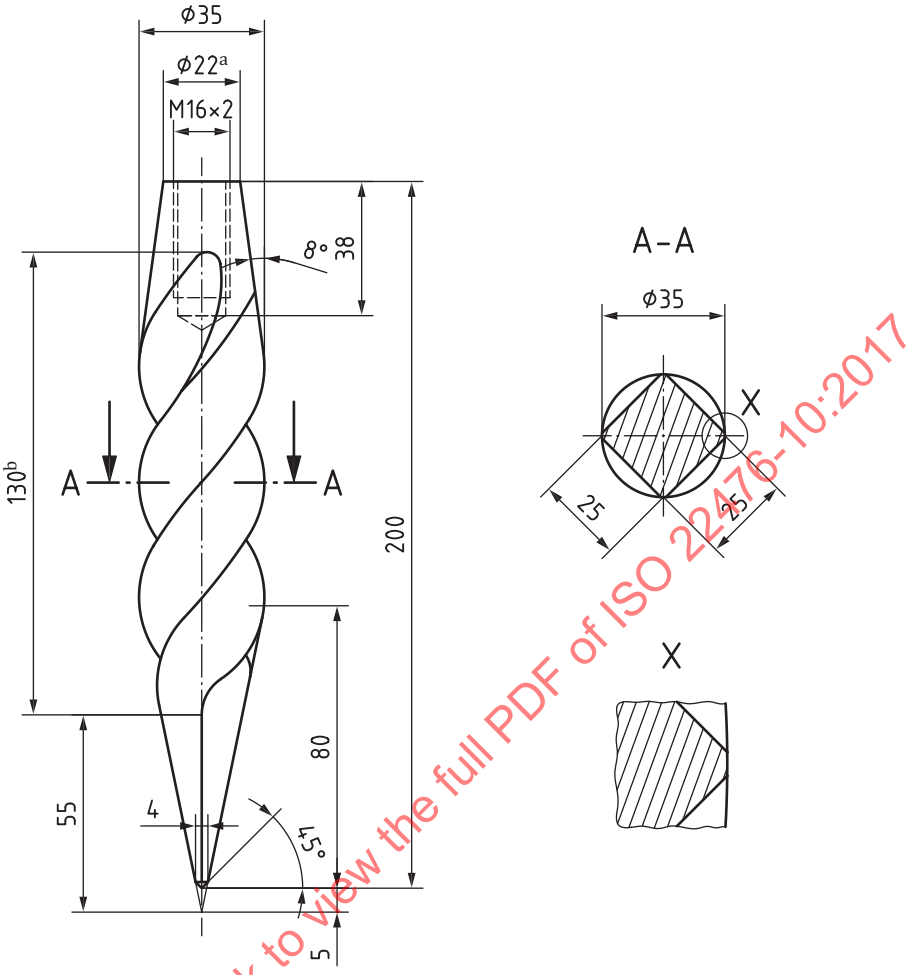
The dimensions of the penetrometer point are shown in Figure 1. The diameter of the circumscribed circle of the screw-shaped point shall be 35 mm. The length of the point shall be 200 mm. The point, which has a screwed cone as shown in Figure 1, shall be twisted one turn to the left over a length of 130 mm. The penetrometer point shall be made of high strength steel.

The diameter of the circumscribed circle for the worn point shall not be less than 32 mm. The maximum allowable shortening of the point tip due to wear shall be 15 mm. The tip of the point shall not be bent or broken.

STANDARDSISO.COM : Click to view the full PDF of ISO 22476-10:2017

© ISO 2017 – All rights reserved

Dimensions in millimetre



Key

a For 22 mm rods.

b Twisted one turn to the left: 130 mm.

Figure 1 — Point of the weight sounding penetrometer

STANDARDSISO.COM : Click to view the full PDF of ISO 22476-10:2017

4.2 Weight loading system

The weights for the manual weight sounding test shall comprise of one 50 N clamp/handle, two 100 N weights and three 250 N weights, totalling 1 000 N.

The weights for the mechanized weight sounding test may be replaced by a dynamometer with the measuring range from 0 up to a minimum of 1 100 N.

The loading against the rods shall be centralized with the rods axis and the loading shall create only vertical compression on the rods. The allowable maximum deviation of the actual loading shall be 50 N.

4.3 Rods

The diameter of the rods shall be 22 mm. The weight of a rod shall be 2,5 ± 0, 5 kg/m. The rods and couplings shall be made of high strength steel.

The length of the extension rod should be 1,0 m to 2,0 m. For practical reasons, the length of the first rod may be 0,8 m. The accuracy required of the measuring system for the depth of the sounding tip shall be ±10 mm/m.

© ISO 2017 – All rights reserved

The deviation from the straight axis shall not exceed 1 mm/m for the lowest 5 m of the rods and 2 mm/m for the rods above this section. The allowable eccentricity of the coupling shall not be more than 0,1 mm. The angular deviation for a joint between two straight rods shall not be more than 0,005 rad.

5 Test procedure

5.1 Calibration and checks

Prior to each test, a check of the condition of the equipment shall be made (wear of point, straightness of the rods, etc.).

The measuring devices of the sounding machinery and instruments shall be available to be checked and tested independently.

The precision of the measuring instruments, if applicable, shall be checked after any damage, overloading or repair, but at least once every six months, unless the manufacturer specifies any shorter inspection intervals. Calibration records shall be kept together with the equipment.

5.2 Use of predrilling and casing

The need to predrill through the upper stiff or dense soil layers, made ground or fill shall be estimated in each case. Predrilling, and the depth of predrilling, shall be recorded and reported.

NOTE Predrilling is often required through a dry crust or through a made ground or fill in order to minimize skin friction along the rods and increase the sensitivity of the penetrometer.

5.3 Manual weight sounding

When the penetrometer is used as a static penetrometer in soft soils, the rod shall be loaded in steps using the following standard loads: 0 N, 50 N, 150 N, 250 N, 500 N, 750 N and 1 000 N. The maximum standard load is 1 000 N.

The minimum possible load shall be used to obtain penetration. The load shall be adjusted in the standard steps to give a rate of penetration of 20 mm/s minimum and 50 mm/s maximum. When a load step passes, the higher load step shall be recorded.

If the penetration resistance exceeds a load of 1 000 N or the penetration rate at a load of 1 000 N is less than 20 mm/s, the rod shall be rotated. The load of 1 000 N is maintained and the number of half turns required to give 200 mm penetration shall be counted. If the point penetrates from a firm layer into a soft or loose layer underneath it, the rods may start to penetrate without turning. In such conditions, the load shall be reduced to stop the penetration. After the rods stop, the load is increased to determine the minimum load needed for penetration. Then, the test shall be continued.

The rod shall not be rotated when the penetration resistance is less than 1 000 N.

If the penetration comes to a stop, the rods shall be struck with a sledgehammer or loaded with percussion drilling to check that the stop is not temporary. If possible, the sounding shall be continued with another rotation phase.

The sounding is terminated either

a) at the specified depth, or

b) when a firm layer is reached and the number of half turns increases to a specified number. The existence of the firm layer shall be checked by striking the rod with a sledgehammer, overloading or driving it with a percussion drilling unit. The applied method shall be chosen according to the specification of the investigation of the project site and it shall be presented in the field report.

STANDARDSISO.COM : Click to view the full PDF of ISO 22476-10:2017

 © ISO 2017 – All rights reserved

5.4 Mechanized weight sounding

The mechanized weight sounding test shall be carried out in a similar manner as for the manual weight sounding test.

During the sounding, vibrations from the engine shall be kept at such a level that they do not affect the measured penetration resistance.

The applied load should be measured by a dynamometer or a measuring cell attached to the machine. The load steps shall be the following standard loads: 0 N, 50 N, 150 N, 250 N, 500 N, 750 N and 1 000 N. The maximum standard load is 1 000 N.

The minimum possible load shall be used to obtain penetration. The load shall be adjusted in the standardized steps to give a rate of penetration of 20 mm/s minimum and 50 mm/s maximum. When a load step passes, the higher load step shall be recorded.

If the penetration resistance exceeds a load of 1 000 N or the penetration rate at a load of 1 000 N is less than 20 mm/s, the rod shall be rotated.

The rate of rotation should be between 15 and 40 turns per minute. The recommended rate of rotation is 30 turns per minute. The rate of rotation shall not exceed 50 turns per minute.

The load of 1 000 N is maintained and the number of half turns required to give 200 mm penetration shall be counted. If the point penetrates through a firm layer into a soft or loose layer underneath it, the rods may start to penetrate without turning. In such conditions, the load shall be reduced to stop the penetration. After the rods stop, the load is increased to determine the minimum load needed for penetration. Then, the test shall be continued.

The rod shall not be rotated when the penetration resistance is less than 1 000 N.

If the penetration comes to a stop, the rods shall be struck with a sledgehammer or a hydraulic hammer, loaded with percussion drilling or overloaded to check that the stop is not temporary. If possible, the sounding shall be continued with the rotation phase.

The sounding is terminated either

a) at the specified depth, or

b) when a firm layer is reached and the number of half turns increases to a specified number. The existence of the firm layer shall be checked by striking the rod with a sledgehammer or a hydraulic hammer, by driving with a percussion drilling unit or overloading the rod. The applied method shall be chosen according to the specification of the investigation of the project site and it shall be presented in the field report.

5.5 Safety requirements

National safety regulations shall be followed, for example, for:

— personal protection equipment;

— clean air (if working in confined spaces);

— ensuring the safety of personnel and equipment.

6 Test results

The penetration resistance for the manual weight sounding test shall be given by the standard loads in stages (N) and when rotated, loaded with the maximum standard load, and by the number of half turns per 0,20 m of penetration.

STANDARDSISO.COM : Click to view the full PDF of ISO 22476-10:2017

© ISO 2017 – All rights reserved

The penetration resistance for the mechanized weight sounding test shall be given by the standard loads in stages (N), and when rotated, loaded with the maximum standard load, by the number of half turns per 0,20 m of penetration and when hammered at the depths where the hammer has been used.

In both cases, the weight sounding resistance shall be reported, if applicable.

Differences between manual and mechanized tests may occur. Where this may be the case, e.g. when estimating the relative density of loose cohesionless soils, comparisons between manual and mechanized tests are recommended.

NOTE The penetration resistance is influenced by the shaft friction along the rods.

For identification and classification of the ground, the results of sampling (according to ISO 22475-1) from at least one borehole, trial pit, shaft or heading shall be available for the evaluation of the tests. In addition, identification and classification results (according to ISO 14688 (all parts) and ISO 14689-1) shall be available from every separate ground layer within the desired investigation depth.

7 Report

7.1 Field report

The field report shall contain the field logs and relevant observations made during the tests, including:

a) name of company executing the test;

b) identification of the actual site or area;

c) sounding number;

d) date of investigation;

e) ground elevation level and location (as local or general coordinates);

f) type of test method used with reference to the standard;

g) type of machine and its identification information;

h) the type of the loading device;

i) predrilling, diameter and depth of the borehole;

j) diameter of the casing tube and depth of casing;

k) depth of water (when test executed on water area);

l) penetration depth for every standard load during the static sounding phase;

m) the number of half turns required for every 0,20 m of penetration during the rotating phase; in cases when a full section of 0,20 m is not penetrated, the number of half turns and corresponding penetration;

n) the depth of penetration if the penetrometer is driven by hammer blows;

o) the depth of penetration and the applied method, when the penetrometer is driving by percussion drilling, hydraulic hammer or overloaded;

p) interruptions during the test;

q) all observations which may help in the interpretation of the test results, e.g. identification of the type of soil or other material penetrated, presence/depth of frost, ground water observations;

r) other: weather conditions, unusual events;

STANDARDSISO.COM : Click to view the full PDF of ISO 22476-10:2017

 © ISO 2017 – All rights reserved

s) name and signature of the test equipment operator in charge.

7.2 Test report

The test report shall include all data from the field report as specified in 7.1.

In addition, the test report shall include all relevant information for identification and quality assurance purposes:

— the data of used machinery and their calibration records;

— ground elevation level and location of the soundings as general coordinates when requested;

— any other information or observations which may help in the interpretation of the test results;

— name and signature of the field manager.

STANDARDSISO.COM : Click to view the full PDF of ISO 22476-10:2017

© ISO 2017 – All rights reserved